Author's Copy Educational Purposes Only

ELSEVIER

Health Policy 43 (1998) 15–31

HEALTH policy

Income-based incentives in UK general practice

David K. Whynes *, Darrin L. Baines

Health Economics Unit, Department of Economics, University of Nottingham, Nottingham NG7 2RD, UK

Received 25 July 1997; accepted 2 October 1997

Abstract

Since 1990, income-based economic incentives have ostensibly become more important in the remuneration structure of UK general practitioners. For incentives to fulfil their role, however, GPs must possess discretion over income-generating activity and be assumed to be income maximisers. Evidence from one English health authority suggests that a very high proportion of GP income continues to be determined by patient characteristics and the scope for a discretionary response to income incentives is correspondingly small. Where discretion does exist, higher levels of GP incomes do not appear to militate against further discretionary income raising, except in the case where this income and budgetary discipline are in conflict. © 1998 Elsevier Science Ireland Ltd.

Keywords: General practice; Incentives; Income

1. Introduction

The general practitioner (GP) in the United Kingdom is conventionally referred to as the 'gatekeeper' of the National Health Service (NHS). This nomenclature accurately reflects the role. Each member of the population is entitled to be included on a GP's list of patients, such inclusion signifying that the individual is entitled to consult his or her GP whenever a medical need arises. Such needs might

* Corresponding author. Tel.: +44 115 9515463; fax: +44 115 9514159.

0168-8510/98/$19.00 © 1998 Elsevier Science Ireland Ltd. All rights reserved.
PII S0168-8510(97)00078-X

be addressed by services offered within the practice itself, for example, via a consultation and the issue of a prescription for drugs. Alternatively, the GP may refer the patient on to secondary care, for example, a specialist diagnostic or treatment unit within a hospital. Except in emergencies, direct patient access to secondary care is rare in the NHS. In 1993, there were some 35 000 GPs, the majority of whom were operating in partnerships of two or more practitioners. The mean list size was approximately 1850 patients per GP [1].

As far as the patient is concerned, NHS care is largely available at zero price. In legal terms, GPs are independent contractors to the Department of Health; they offer their services to NHS patients in exchange for a variety of fees and allowances paid from the general tax fund, via the Department of Health and their local health authority (HA). The HAs bear most of the costs incurred in treating the GPs' patients, although a small proportion is met from GP income. For the period prior to 1990, the remuneration structure followed that laid down in the 1965 Charter of the Family Doctor Service and comprised three principal elements. First, GPs received fixed incomes in the form of a series of allowances, dependent upon practice and GP characteristics but independent of list size. They received, second, capitation fees related to the number of patients on their lists, and third, fees-for-service derived from the performance of certain specific activities [2].

In 1990, the NHS Act introduced major institutional changes into public sector health care. A quasi- or internal market was created, wherein purchasers, such as HAs, bought services from care providers, such as hospitals. From the point of view of general practice, possibly the most significant innovation was the creation of 'fundholding', whereby a larger partnership could opt to manage its own practice budget or 'fund' independently of its HA. The practice fund was allocated in advance by this HA, to cover the costs of prescribed medicines, practice staff and the purchase of a range of secondary care treatments from secondary care providers. HAs continued to purchase care on behalf of practices remaining outside the fundholding scheme, although such practices were given nominal or target budgets for prescribing [3].

To complement this Act, a new contract, specifying terms of service and remuneration, was imposed on all GPs, fundholders and non-fundholders alike. This contract changed the balance of personal incomes earned under the original headings and added a new one. First, more weight was to be placed on capitation fees relative to fixed allowances and, in part, this was accomplished by the abolition of certain existing allowances. Second, a selection of activities was removed from the GP's general responsibilities and became the subject of specific fees-for-service. Prior to 1990, for example, health promotion was considered to be part of the GP's normal service to patients and was rewarded as an element of the basic allowance and capitation income. Post-1990, specific fees could be earned in proportion to the health promotion effort undertaken. Suitably qualified GPs became entitled to conduct (paid) minor surgical procedures for their patients, rather than refer them to hospitals. Third, three activities which had previously attracted fees-for-service—screening for cervical cancer and two immunisation programmes for children—now attracted target payments. The income received in such cases was to be

determined by the extent to which GPs were successful in reaching certain established targets, for example, arranging cervical screening for at least 50 or 80% of eligible women in the practice. Naturally, achievement of the lower target entailed lower remuneration than achievement of the higher, ceteris paribus [4–6].

In theory at least, these recent changes in the GP contract appear consistent with one of the fundamental intentions of the 1990 Act, namely, to offer the greatest "rewards for those working in the NHS who successfully respond to local needs and preferences" [7], p. 4. Responsibility for more patients will now bring GPs proportionately more income, as will the provision of more fee-for-service items and the achievement of higher target levels. In order to receive more rather than less income in general, the GP must offer more rather than fewer primary care services in general, which, in the present context, we shall presume to be desirable. Indeed, by making GP revenue more heavily dependent upon patient numbers and services, it was anticipated that inter-GP competition for patients would increase, thereby providing incentives for efficiency and effort. This approach, it must be stressed, makes certain strong assumptions, for example, that patients would actually be willing to move between practices. More specifically, it presumes that patients possess sufficient information to make judgements about the relative merits of the services provided by the alternative GPs, with each of whom they might, in principle, register. In areas where practice density is low, moving to another practice might be particularly inconvenient in terms of access. From the GPs' point of view, the competitive model presumes that a practice would always be willing to accept more patients, i.e. that GPs would always be concerned to obtain more income.

In this paper, we argue that this simple description of the income-based incentive structure currently facing GPs is problematic, essentially because the discretion logically required of an incentive is largely absent. On the basis of evidence from practices in a single English health authority, we explore the extent to which income generation is pre-determined by factors outside the GPs' control, thereby constraining the circumstances in which incentives might conceivably operate.

2. GPs and economic incentives

That GPs in the UK are broadly conscious of their overall economic environment is a well-established proposition. For example, it has been shown that the development of primary care teams and GP partnerships in the 1980s can be attributed primarily to demand pressures and supply opportunities, especially the availability of labour and sites for new premises [8]. "Innovation was typically found in large practices in areas that were more socially attractive", whereas "the low investing group had long experience, long lists of patients and the ability to maximise net income" [9], p. 669. If we move from the general to the specific, however, we find that the existing research evidence on physician responses to incentives is more ambiguous. It should be borne in mind that much of this research has been conducted within health care systems such as those of North

America, which are radically different from the NHS [10]. The extent to which the findings of non-UK research travel across national boundaries is uncertain, in view of institutional and cultural differences.

For the UK specifically, the introduction of fees for cervical cytology in the 1960s certainly led to a sizeable increase in the number of tests being carried out, although it remains unclear whether the economic incentive effect was responsible, as opposed to changing professional attitudes and increased patient demand for the service [11]. Essentially similar remarks can be made with respect to the growth in GP provision of contraceptive services, which began to attract specific fees in the 1970s [12]. On the other hand, the existence of fees for obstetric care did not prevent a sizeable reduction in the proportion of GPs willing to provide a full obstetrics service between the 1960s and the 1980s, suggesting that factors other than prospective remuneration were influencing GP decisions in this respect [13]. More recent research into changes in per-item fees more generally failed to detect a significant impact on service provision [14]. Many GPs have evidently seized the opportunity offered by the facility to offer minor surgery to their patients, although expansion in this area may have as much to do with their perceptions of improving quality of care by service development as with financial incentives [15,16].

Although the broad direction set by the 1990 contract persists, a number of further changes to remuneration structures have occurred since that date and two, in particular, have a bearing on the incentive issue. First, the contract originally stipulated that GPs would receive a fixed fee for each health promotion clinic offered to patients. The number of clinics offered subsequently grew rapidly, as did claims for remuneration: total fees paid to UK GPs amounted to £50 million in 1990–1991 and £80 million in 1992–1993. These data alone would appear to support the existence of a positive incentive effect in this case. Both the profession and the government became alarmed by the prospect of continued escalation and the incentive structure was revised, by cash-limiting the amounts payable for health promotion activities [17]. Second, remuneration for out-of-hours services (night visits to the patient's home) has been revised, from a fee per visit to a fixed payment per annum plus a substantially lower fee per visit [18]. Being recent in origin, the behavioural consequences of these latest revisions to the contract remain to be analysed.

On the basis of equivocal research evidence, let us deconstruct the notion of an income-related incentive. The concept presumably implies the existence of discretion, in that GPs are supposedly being offered compensation to do things that they would otherwise elect not to do. What is not clear, in empirical terms, is the extent to which the GP's terms of service and the specific characteristics of both the practice and its patients actually oblige the GP to undertake activities whilst simultaneously pre-determining the amount of income received. The formal definition of GPs' statutory responsibilities has, in the past, been vague and somewhat unhelpful, GPs being "required to provide for their patients all necessary and appropriate personal medical services of the type usually provided by GPs" [17], p. 16. This having been said, the General Medical Services Regulations prevailing in the early 1990s specifically defined, inter alia, patient consultations, health promo-

tion, vaccinations and referral to secondary care as required services to patients in need, although no obligation was placed on GPs to provide contraceptive services, child health surveillance, minor surgery or non-emergency maternity services unless a specific contract for such services had been agreed. With respect to the three target payments activities, GPs appear to be required to provide the services when need or demand presents, although there is no formal obligation to meet the targets and to qualify for payments.

Over and above the requirements of the Regulations, GPs will inevitably define their own ethical obligations with respect to the quality of service provision, either in the sense that they feel that their peers would be likely to regard non-performance of certain activities as evidence of inadequate effort or unprofessional conduct, or in the sense that they feel that their self-defined duties of care to patients require that these activities are undertaken. We may therefore formalise the entire line of the income-incentive argument by considering GP behaviour in terms of the maximisation of a utility function:

$$U = f(Y, C, Q)$$

where Y = personal income, C = costs, both time and money, and Q = quality of care provided, or the GP's perception of his or her patients' welfare. Quality of care is, in turn, a function of the level and mix of services offered by the GP. There will be two constraints in this system, namely, the maximum amount of personal and practice resources (C) which the GP has available to generate both Y and Q, and a minimum level of Q, $Q_{\min}$, representing an acceptable interpretation of statutory and ethical obligations. Beyond $Q_{\min}$, therefore, income-generating activity is genuinely discretionary.

This model suggests two interesting questions, the first being: how large is $Q_{\min}$? Clearly, if it is sufficiently large to require the full amount of available resources, the scope for earning discretionary income falls to zero and service-related income payments have no incentive effects per se. What appear to be incentive payments are simply tariffs for services provided under obligation; the prevailing financial structure is simply defining earnable income without changing behaviour.

At this stage of the argument, let us assume that the scope for earning discretionary income can be shown to be positive, and this leads to the second question: is the utility–income relationship in the utility function linear or, more specifically, is the function characterised by diminishing marginal utility of income? If this were to be the case, incentives would operate differently on GPs at differing income levels. Ceteris paribus, a fixed schedule of target payments would provide a stronger incentive for a 'poor' GP than for a 'rich' one, and the latter would be less inclined to take steps to meet the target.

These two questions will be explored empirically, by means of the analysis of data derived from a single English county—Lincolnshire—for the financial year 1993–1994. At that time, Lincolnshire comprised 105 practices. The average list size was 1897 patients per GP, close to the national average, within a range 694–3772. We acquired information pertaining to GP remuneration, practice activities and characteristics and the demographic structure of patient lists for all practices. The

data were obtained from HA records, the financial data deriving from the routine payments system. We begin by outlining the structure of GP remuneration prevailing at that time.

3. Sources of GP income

As part of the formalisation of GP remuneration, the 1965 Charter entailed the Department of Health publishing the Statement of Fees and Allowances, which described the formulae used for calculating each of the wide variety of payments available to GPs in return for the range of services contracted to the NHS. Since 1972, the Statement has been produced as a loose-leaf, ring-bound volume with a red binding. For the obvious reason, it is colloquially referred to as the Red Book. The regular amendments and additions are published as new pages, thus allowing GPs to maintain an up-to-date version [17].

The Red Book describes the method of calculation for each of the many income areas individually. However, for the purposes of the present discussion, it is convenient to classify GP income into four broad categories. We shall define the first as comprising 'service-independent' incomes, those which accrue to the GP purely on the basis of personal or patient characteristics. Within our data set there were five major components. First, the basic practice allowance (BPA) is a simple increasing function of the number of patients appearing on the GP's list. Second, the standard capitation fee (SCF) is a function both of the number and of the age distribution of patients for which the GP has assumed responsibility. A patient aged 75 years, for example, attracted an SCF of £36.45 in 1993/94, whilst an 18-year-old would have generated £14.30. Third, deprivation payments are calculated on the basis of the number of patients living in areas of high, medium and low socio-economic deprivation. A resident in a high deprivation area, for example, attracted the maximum payment of £9.95. The differential tariffs for both age and deprivation are designed to reflect the differential use of GP services which groups defined in such terms make [19,20]. Fourth, rural practice payments are a complex function of the geographical spread of the practice's patients and are intended to compensate for the increased effort of caring for patients resident 3 or more miles from the main surgery. Fifth, seniority payments are calculated on the basis of the age of each partner in the practice.

Whilst the provision of care services is, of course, entailed by the receipt of service-independent income, the amount received by the practice does not vary with the level of services provided; hence, the chosen heading for the category. In contrast, fee-for-service incomes accrue following the delivery of a variety of specific services on a unit-by-unit basis. In 1993–1994, the major components of fee-for-service income were child health surveillance, the provision of contraceptive and maternity services, health promotion programmes, paid minor surgery, out-of-hours services (night visits to the patient's home), treatments for patients not normally included on the practice list (temporary residents), the registration of patients joining the practice and vaccinations. Thus, for example, the fees generated

by each measles immunisation and the registration of a new patient were £5.00 and £6.30, respectively, in 1993/1994. The complete maternity medical service generated £165.05 for GPs registered on the obstetrics list, but only £96.30 for those not so registered. The out-of-hours service attracted £46.65 or £15.55 per visit, the higher fee being payable if practice personnel were directly involved in the visit. For Lincolnshire in 1993/1994, all GPs claimed at the higher fee level. The amount of income claimable per GP for minor surgery was cash-limited at approximately £1200 for the financial year. At the start of 1993/1994, health promotion generated £45.00 per clinic offered, although a cash limit of £2105 per GP with an average list size (higher for longer lists) was introduced mid-way through the year. However, as compensation based on previously planned clinic activities was paid to those disadvantaged by the introduction of the limits, this income can be considered as non-limited over the financial year.

In the third category, three activities—screening for cervical cancer, immunisation of children under 2 years of age and a booster immunisation for slightly older children — attracted target payments. As noted earlier, the income received in such cases was determined by the extent to which the GP was successful in reaching certain established targets, although the absolute amount of income received depended also on the number of eligible subjects relative to those in a practice of average list size.

Finally, certain practices in the UK have been accorded 'dispensing' status by their HAs and are permitted to dispense the medicines they prescribe to patients living more than 1 mile from an independent pharmacy. The facility is ostensibly intended to enhance patient convenience by, in effect, compensating for the low density of pharmacies in rural areas [21]. Remuneration for dispensing consists essentially of a fee and an allowance based on the drug price for each item dispensed. Dispensing income is technically a fee-for-service. However, we categorise it separately as, unlike the other fee-for-service items, it is only available following the approval of dispensing status, which depends upon factors outside the practice's control. Lincolnshire is a rural county and possessed 55 dispensing practices in 1993/1994, 52% of the total. As will become apparent, it is the existence of an almost-even split between the two types of practices which makes the Lincolnshire data an ideal vehicle to test the hypotheses under consideration.

In parallel with generating income by the provision of primary care services, the GP obviously incurs financial costs. However, certain major expenditure items pertaining to the operation of the practice's premises, such as rent and local taxes, are directly reimbursed by the HA. The costs of staff are partially reimbursed, although the proportion of reimbursement varies between HAs. In other cases, GPs' personal expenses are allowable against tax but are not otherwise compensated, for example, the use of a car. The implication is that certain of the income categories are more accurately gross incomes rather than net incomes. As noted above, for example, rural GPs will be likely to incur higher private costs of time and travel in undertaking their home visits, and the rural practice payment offers compensation. We have excluded from our income audit remuneration which simply represents reimbursements of costs, for example, the postgraduate education

allowance from which course fees and subsistence have to be met [22]. Irrespective of whether gross or net income is represented, however, all GP's will be treated equally under the criteria. Thus, it is reasonable to treat personal cost considerations as independent at the margin and consider the analysis of GP behaviour solely in terms of income received.

4. GP incomes in Lincolnshire

Table 1 presents descriptive statistics on mean incomes by category and subcategory for the dispensing and non-dispensing practices of Lincolnshire. The table presents significance levels for the t-test of differences between means. As is evident, the additional dispensing income of GPs in dispensing practices significantly raised their mean income over that of non-dispensing GPs by some 36%. Of the subcategories of income displayed in Table 1, the average income for dispensing and non-dispensing GPs differed significantly in seven cases and, for six of these, the mean income of the dispensers was lower.

The differences in the two cases within the service-independent income category are easily explained by structural, rather than behavioural, factors. The data show that dispensing GPs received higher mean rural practice payments. However, rurality is a defining criterion for dispensing status and, unless the authorities allocating dispensing status had been completely in error, this result would have been expected. Dispensing GPs received lower mean deprivation payments and, indeed, measured deprivation was lower for such practices. The assessment of deprivation within general practice areas is conventionally based on the Jarman index, which includes arguments such as unemployment, overcrowded accommodation, lone parents and geographical mobility [23,24]. In our data set, the deprivation index took values in the range ± 25, with higher scores indicating greater deprivation. The mean score for non-dispensing practices, at 4.8, was significantly higher than that of dispensing practices, at -8.7 (t-test, $P < 0.01$).

In the five other cases of fee-for-service or target payments, the dispensing practices (with higher total average gross incomes) generated significantly less income per GP than did the non-dispensing practices (with lower total average gross incomes). The mean income difference between dispensers and non-dispensers across these five categories was £2175, approximately 4% of the non-dispensing income of dispensing practices. From our earlier discussions, it will be recalled that these five cases fall into the category where statutory obligations are either absent or ill-defined and where discretion may therefore play a part in service provision. At first viewing, therefore, the evidence of Table 1 appears to provide responses to our two questions. The results appears consistent with higher-income dispensing practices having a lower reservation value of $Q_{\min}$, a lower marginal utility of income, or a combination of the two. A more considered approach, however, reveals a more plausible interpretation.

Whilst the preponderance of service-independent income is generated simply by patient numbers, the income-generating potential of fees-for-service depend upon

Table 1
Components of income per GP

	Non-dispensing			Dispensing				$P =$
	Mean	S.D.	% Total	Mean	S.D.	% Total	% Total exc. dispensing	
Service-independent	40877	9883	65.9	42166	9366	49.8	70.1	0.54
Basic practice allowance	6157	1032	9.9	6427	1375	7.6	10.7	0.26
Deprivation payments	559	1116	0.9	7	42	0.0	0.0	0.00
Rural practice payments	1302	2313	2.1	3525	2212	4.2	5.9	0.00
Standard capitation fees	31623	8991	51.0	31071	8228	36.7	51.7	0.74
Seniority payments	1236	990	2.0	1136	834	1.3	1.9	0.56
Fees for service	16210	5217	26.1	13675	4825	16.2	22.7	0.01
Child health surveillance	1103	576	1.8	811	456	1.0	1.3	0.01
Contraceptive services	2096	923	3.4	1574	583	1.9	2.6	0.00
Health promotion clinics	2433	809	3.9	2355	947	2.8	3.9	0.65
Maternity medical services	2875	1201	4.6	2015	825	2.4	3.3	0.00
Paid minor surgery	964	427	1.6	1017	423	1.2	1.7	0.53
Registration of new patients	910	646	1.5	707	559	0.8	1.2	0.09
Out-of-hours services	3208	1366	5.2	2892	1154	3.4	4.8	0.20
Treatment of temporary residents	1420	2419	2.3	1246	2262	1.5	2.1	0.71
Vaccinations and immunisations	1201	767	1.9	1057	617	1.2	1.8	0.29
Target payments	4937	2130	8.0	4314	1265	5.1	7.2	0.08
Cervical cytology	2358	987	3.8	2236	689	2.6	3.7	0.46
Childhood immunisation	1963	1049	3.2	1572	560	1.9	2.6	0.02
Pre-school booster	616	277	1.0	507	224	0.6	0.8	0.03
Total (excluding dispensing)	62024	15462	100.0	60155	14037	71.1	100.0	0.49
Dispensing fees and allowances				24471	12446	28.9		
Dispensing fees				13208	6744	15.6		
Oncost and other allowances				11263	5822	13.3		
Total	62024	15462		84626	22266	100.0		0.00

more subtle characteristics of the practice list. Consider, to begin with, two subcategories where dispensers do not appear to differ from non-dispensers. First, it is obvious that the GP will receive no income from treating temporary residents if such individuals fail to present themselves at the practice. Based on the full sample, the correlation coefficient between income from treating temporary residents and the proportion by which the GP's regular list is inflated by the influx of temporary residents is 0.97. In this case, the income predictor is quite apparent, and it has little to do with deliberate discretionary activity on the part of the GP. Temporary migration is more common in the urban centres and holiday resorts of Lincolnshire and this form of fee-for-service income is therefore essentially dictated by geography, i.e. circumstances external to the practice. Second, and more subtly, it is likely that fee-for-service income generation depends not only on the number of patients on a GP's list but also on their ages. For example, evidence suggests that the most regular users of out-of-hours services are the very young and the very old [18,19]. The implication is that the larger the numbers of patients in these extreme age categories with which the practice is endowed, the higher the incomes from night-visiting which the GPs will be capable of earning.

If external factors such as demographic structure are relevant in explaining income variations for one fee-for-service item, the possibility exists that they would also be relevant in explaining the difference in income in the five subcategories which distinguished dispensers and non-dispensers. More patients on a list should lead to more services being demanded, although the nature of services under consideration suggests that demographic structure is likely to be significant in these cases also. Three of the five services being considered pertain specifically to young children, for example, and a practice endowed with few children will be constrained in its income generation capacity.

The issue may be resolved by estimating income generation regression models with respect to each of the five areas identified, each dependent variable being expressed as income per GP. The following independent variables were initially considered for inclusion in the models:

(i) GP workload and non-GP practice staff effort, on the basis that higher incomes from fee-for-service and target payment items would require more practice inputs. Our proxy for non-GP staff effort was annual expenditure on practice staff per GP.

(ii) Numbers of patients on the average GP list, by age, for the reason noted above. We possessed data for the number of patients by practice in each of six age cohorts, namely, 0–4, 5–15, 16–44, 45–64, 65–74 and 75 and above years of age.

(iii) The Jarman score, given the established association between deprivation and the use of GP services generally.

(iv) Three dummy variables, in order to reflect the four possible combinations of fundholding and dispensing status. Eight of Lincolnshire's 19 fundholders were dispensing practices, as were 47 of the 86 non-fundholders. Fundholding status was included in the models in view of the growing body of evidence that management characteristics and GP behaviour in fundholding practices may differ from that of non-fundholders [25,26]. For our initial suppositions about GP behaviour to be

true, significant negative coefficients for the dispensing dummies would be required in the regression models.

Two modifications were made to this original list. First, our data on GP workload were restricted to self-reported and optional inclusions in the annual practice reports. These data were incomplete and such information is generally held to be of uncertain quality [27]. Accordingly, we elected not to include this variable in the regression models. Second, our initial regression experiments indicated high degrees of multicollinearity in the patients-by-age data noted in (ii) above. These data possessed a Kaiser–Meyer–Olkin measure of sampling adequacy of 0.73, suggesting the possibility of reduction by means of factor analysis. The results of a varimax rotation appear in Table 2, along with descriptive statistics for the age cohorts. As may be seen, the first factor ($F1$) is readily interpretable as representing the younger age cohorts, whilst the second ($F2$) represents the older age groups. In combination, they explain a high proportion of the variance. Standardised factor scores were accordingly entered into the regression models in place of the six patients-by-age variables. In no case, for these and the subsequent models, was there any evidence of significant multicollinearity or heteroscedasticity.

The results of the five regressions appear in Table 3. Demographic factors evidently play the principal role in income determination in all cases, although deprivation appears important for maternity services. In only one case does a dispensing dummy variable emerge as a statistically significant factor in explaining income (pre-school booster amongst non-fundholders). Given that a number of multiple comparisons are being made, one significant coefficient as a result of chance is not unlikely. Moreover, the implied income difference in this case is small in absolute terms and, of the five areas considered, this activity contributes least to average GP income.

From these analyses, we conclude that a very high proportion of the difference in income by area observed in Table 1 is likely to be explained by factors other than by differential income-generating behaviour. Put another way, given the structural parameters which they face, there is little evidence that, on average, GPs with a

Table 2
Demographic structure of patient list

Patient age groups (years)	Mean number per GP	S.D.	Rotated factor matrix	
			$F1$	$F2$
0–4	107.3	41.6	0.96	0.12
5–15	250.7	87.9	0.94	0.22
16–44	695.5	224.0	0.92	0.30
45–64	477.8	134.6	0.44	0.84
65–74	210.7	72.5	0.18	0.95
≥75	151.3	55.9	0.11	0.95
	Cumulative percentage of variance explained:		67.1	92.5

Table 3
Regressions results for income-difference variables

	Child health surveillance		Contraceptive services		Maternity services		Childhood immunisation		Pre-school booster	
	β	T-ratio	β	T-ratio	β	T-ratio	β	T-ratio	β	T-ratio
Staff costs (£'000)	−1.23	−0.17	14.89	1.45	−9.03	−0.67	6.86	0.68	−1.69	−0.42
Jarman score	3.21	0.78	2.75	0.47	18.70	2.46	5.41	0.95	−3.59	−1.59
$F1$	404.78	8.57	515.79	7.70	844.65	9.66	667.26	10.15	172.30	6.61
$F2$	−20.24	−0.52	3.71	0.07	84.84	1.18	14.27	0.26	36.82	1.71
Dispensing non-fundholder (yes = 1)	−34.24	−0.35	−192.42	−1.39	−287.98	−1.59	−39.68	−0.29	−113.59	−2.10
Dispensing fund-holder (yes = 1)	−61.46	−0.43	−212.54	−1.05	−321.46	−1.21	61.93	0.31	−22.10	−0.28
Non-dispensing fundholder (yes = 1)	49.37	0.42	−11.55	−0.07	−72.40	−0.33	−47.20	−0.29	−10.10	−0.15
Constant	986.40	6.48	1637.09	7.59	2786.33	9.90	1657.77	7.83	634.10	7.55
Adjusted R^2	0.58		0.62		0.67		0.69		0.46	

Table 4
Total income regression results

	Total non-dispensing income		Total income	
	β	T-ratio	β	T-ratio
Staff costs	0.23	2.48	1.11	6.43
Jarman score	128.01	2.40	127.88	1.21
$F1$	9600.40	15.60	7029.79	5.85
$F2$	8266.51	16.26	7840.57	7.75
Dispensing non-fundholder (yes = 1)	1235.96	0.97	4294.07	9.75
Dispensing fundholder (yes = 1)	2610.39	1.40	15105.66	4.09
Non-dispensing fundholder (yes = 1)	−229.32	−0.15	−1475.88	−0.48
Constant	57984.72	29.25	41580.32	11.27
Adjusted R^2	0.91		0.85	

large independent source of income (dispensers) act in ways different from GPs without such a source of income (non-dispensers).

5. Does discretionary income actually exist?

In the previous section, we constructed models for the five specific activities where incomes for dispensers and non-dispensers appeared to differ. The logical extension of this approach is to use the same explanatory variables to construct total income generation functions. The results of two such regression models appear in Table 4.

The total non-dispensing income model is successful in explaining a very high proportion of the variance. Of the three variables which GPs might potentially influence—fundholding and dispensing status and staff costs—only staff costs achieve statistical significance. However, the impact of this variable is small: re-estimation of the model without staff costs causes the coefficient of determination to fall by only 0.005. The demographic and deprivation variables possess the most significant coefficients in the model, which therefore supports the view that the capacity to earn income of any kind is largely pre-determined by the characteristics of the patient list.

Whilst the absence of a GP workload variable in the model is an unavoidable limitation, evidence from studies both in the UK [27,28] and the Netherlands [29,30] strongly suggests that exogenous demand factors, in the form of patient numbers, ages and socio-economic status are the principal determinants of GP labour inputs. In a Norwegian study, fee-for-service GPs were observed to display a higher consultation frequency than their salaried colleagues, suggesting an income incentive might be present. However, the behaviour difference was again explicable in terms of demographic structure of patient lists and other factors beyond the GPs' control. Such findings are consistent with the hypothesis that workload, like income, is exogenously determined.

This having been said, the total income equation in Table 4 tells a different story. The formulation is as before but, as total income per GP is being considered, staff costs now include those incurred in dispensing (if appropriate). As before, the staff cost coefficient is significant, as are those for the two demographic variables. Again, fundholding status alone does not appear to exert a significant impact on income. However, the coefficients for the two dispensing dummies are both highly significant and replace the Jarman index in the model (we earlier showed that dispensing practices possessed lower Jarman scores on average). Most importantly, the coefficient for the dispensing fundholders dummy variable is significantly lower than that for dispensing non-fundholders ($t = 2.71$, d.f. $= 97$, $P < 0.01$). By implication, so too must be their average total incomes, ceteris paribus. The explanation for this observation yields a genuine example of discretionary income consciously foregone.

Dispensing income, it will be recalled, results from a fee per item dispensed plus an allowance related to the drug price, and this remuneration structure offers dispensing GPs two specific financial incentives in comparison with non-dispensers. Dispensers would gain financially by prescribing both a larger number of items per patient and items of higher cost, for example, branded medicines rather than generics. Consider, first, the case of dispensing amongst non-fundholding practices. In 1993/1994, the prescribing budgets for such practices were merely indicative or nominal. For Lincolnshire in 1993/1994, non-fundholding dispensers prescribed 11.9 items per patient, in comparison with 10.1 for non-fundholding non-dispensers. Of the items prescribed, 43.9% were generic in the case of the non-dispensers, whilst the figure for the dispensers was 27.0%. Dispensers had a mean prescribing budget overspend of 10.0% in comparison with the non-dispensers' 2.6%. The differences are statistically significant in all cases (t-test, $P < 0.01$). Detailed analysis has already indicated that, even allowing for differences in practice and patient characteristics, the scope for prescribing cost economies is significantly higher in dispensing practices than it is in non-dispensing practices [31]. As a group, therefore, there is very strong evidence that non-fundholding dispensers have responded to income-based incentives to increase their discretionary incomes in this particular fashion.

For the dispensing practice which is also fundholding, however, the position is more complicated, because fundholders operate with real, cash-limited budgets. For the dispensing fundholder, higher prescribing rates and high-price drugs generate more personal income via dispensing fees and allowances but they also contribute to a more rapid erosion of the practice budget. In consequence, less resources would be available for other uses (both patients services and savings for discretionary use within the practice), and the risk of a budget over-spend would increase. In terms of our earlier utility function, therefore, a dispensing fundholder, unlike his or her non-fundholding counterpart, is obliged to trade gains in Y for the needs of budgetary discipline and potential falls in Q. For the subsample of dispensing practices, dispensing fundholders prescribed 17.5% fewer items per patient in comparison with dispensing non-fundholders and achieved a significantly smaller budget over-spend of 3.0, compared with 10.0% (t-test, $P < 0.01$ in both cases). Furthermore, this average over-spend for dispensing fundholders was not significantly different from the -0.1% for non-dispensing fundholders (t-test, $P = 0.16$).

6. Conclusions

As a caveat to this study, we must note that our aggregate cross-section analysis permits neither inferences to be made regarding the dynamic consequences of changes in incentives over time nor an investigation of how specific incentive effects might have operated at the level of the individual practice. Whilst it is quite possible that behavioural changes may have occurred at the margin, our data do not allow such phenomena to be investigated.

Within these limitations, we conclude that the analysis supports the view that a very high proportion of GP non-dispensing income continues to be determined by list size and patient characteristics. Despite the recent changes in the remuneration structure, the scope for a discretionary response to income incentives remains correspondingly small. What appear to be income incentives are essentially mechanical formulae for calculating remuneration for services likely to be initiated in any event. Our empirical findings thus support the belief that the "organisation of general practice, including the incentives built into it, has less impact on how doctors work than the characteristics of the population and the local economy" [32], p. 1157.

Studies conducted in other parts of the UK consistently indicate that the provision of a cash-limited budget gives rise to modifications in prescribing behaviour. Fundholders as a group invariably emerge as lower-cost prescribers in comparison with non-fundholders [33–36]. These Lincolnshire results are of particular interest, however, for three reasons. First, they suggest that dispensing practices respond positively to income incentives peculiar to their status. Second, the prescribing modifications made specifically by dispensing fundholders are in the same direction as those observed for fundholders generally. Third, these modifications have occurred at the expense of the dispensing fundholders' potential income.

Acknowledgements

The authors gratefully acknowledge Lincolnshire Health, as the source of research support and data, and the anonymous referee, for valuable comments on an earlier draft. The views expressed in this paper are those of the authors alone and do not necessarily reflect those of Lincolnshire Health.

References

[1] Office of Health Economics. Compendium of Health Statistics. 9th ed. London: OHE, 1995.
[2] Klein R. The New Politics of the NHS. 3rd ed. London: Longman, 1995.
[3] Whynes DK. The NHS internal market: economic aspects of its medium-term development. International Journal of Health Planning and Management 1993;8:107–22.
[4] Chisholm JW. The 1990 contract: its history and content. British Medical Journal 1990;300:853–6.
[5] Hughes D. General practitioners and the new contract: promoting better health through financial incentives. Health Policy 1993;25:39–50.

[6] Bartlett W. The regulation of general practice in the UK. International Journal of Health Planning and Management 1996;11:3–18.
[7] CM 555. Working for Patients. London: HMSO, 1989.
[8] Bosanquet N, Leese B. Family Doctors and Economic Incentives. Aldershot: Dartmouth, 1989.
[9] Bosanquet N, Leese B. Family doctors: their choice of practice strategy. British Medical Journal 1986;293:667–70.
[10] Scott A, Hall J. Evaluating the effects of GP remuneration: problems and prospects. Health Policy 1995;31:183–95.
[11] Robert A. Cervical cytology in England and Wales, 1956–80. Health Trends 1980;14:41–3.
[12] Cammock DW, Hughes A. Contraceptive workload in general practice in the Trent region. Journal of the Royal College of General Practitioners 1977;27:610–2.
[13] Horder J, Bosanquet N, Stocking B. Ways of influencing the behaviour of general practitioners. Journal of the Royal College of General Practitioners 1986;36:517–21.
[14] Hughes D, Yule B. The effect of per-item fees on the behaviour of general practitioners. Journal of Health Economics 1992;11:413–37.
[15] Bull AD, Silcocks PB, Start RD, Kennedy A. General practitioners, skin lesions and the new contract. Journal of Public Health Medicine 1992;14:300–6.
[16] Silcock J, Ratcliffe J. The 1990 GP contract: modelling variation in minor surgery provision. IMA Journal of Mathematics Applied in Medicine and Biology 1995;12:203–10.
[17] Ellis N, Chisholm J. Making Sense of the Red Book. 2nd ed. Oxford: Radcliffe Medical Press, 1993.
[18] Whynes DK, Baines DL. Explaining variations in the frequency of night visits in general practice. Family Practice 1996;13:174–8.
[19] Baker D, Klein R. Explaining outputs of primary care: population and practice factors. British Medical Journal 1991;303:225–9.
[20] Ben-Shlomo Y, White I, McKeigue PM. Prediction of general practice workload from census based social deprivation scores. Journal of Epidemiology and Community Health 1992;46:532–6.
[21] Ryan M, Bond C. Dispensing physicians and prescribing pharmacists: economic considerations for the UK. Pharmacoeconomics 1994;5:8–17.
[22] Dean J. Making Sense of Practice Finance. 2nd ed. Oxford: Radcliffe Medical Press, 1994.
[23] Jarman B. Identification of underprivileged areas. British Medical Journal 1983;286:1705–9.
[24] Jarman B. Underprivileged areas: validation and distribution of scores. British Medical Journal 1984;289:1587–92.
[25] Coulter A. Evaluating general practice fundholding in the United Kingdom. European Journal of Public Health 1995;5:233–9.
[26] Baines DL, Whynes DK. Selection bias in GP fundholding. Health Economics 1996;5:129–40.
[27] Heaney DJ, Howie JGR, Porter AMD. Factors influencing waiting times and consultation times in general practice. British Journal of General Practice 1991;41:315–9.
[28] Calnan M, Butler JR. The economy of time in general practice: an assessment of the influence of list size. Social Science and Medicine 1988;26:435–41.
[29] Groenewegen PP, Hutten JBF, van der Velden K. List size, composition of practice and general practitioners' workload in the Netherlands. Social Science and Medicine 1992;34:263–70.
[30] Groenewegen PP, Hutten JBF. The influence of supply-related characteristics on general practitioners' workload. Social Science and Medicine 1995;40:349–58.
[31] Baines DL, Tolley KH, Whynes DK. The costs of prescribing in dispensing practices. Journal of Clinical Pharmacy and Therapeutics 1996;21:343–8.
[32] Iliffe S, Munro J. General practitioners and incentives. British Medical Journal 1993;307: 1156–7.
[33] Stewart-Brown S, Surender R, Bradlow J, Coulter A, Doll H. The effects of fundholding in general practice on prescribing habits three years after introduction of the scheme. British Medical Journal 1995;311:1543–7.

[34] Rafferty T, Wilson-Davis K, McGavock H. How has fundholding in Northern Ireland affected prescribing patterns? A longitudinal study. British Medical Journal 1997;315:166–70.
[35] Wilson RPH, Hatcher J, Barton S, Walley T. Influences of practice characteristics on prescribing in fundholding and non-fundholding general practices: an observational study. British Medical Journal 1996;313:595–9.
[36] Whynes DK, Heron T, Avery AJ. Prescribing cost savings by GP fundholders: long-term or short-term?. Health Economics 1997;6:209–11.